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SOCIAL CONFLICT IN RESPONSE TO URBAN SPRAWL IN RURAL AREAS. URBAN RECONFIGURATION OF THE MEZQUITAL VALLEY AS INFLUENCE AREA OF THE MEGALOPOLIS OF MEXICO CITY

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Abstract

The urban sprawl of metropolitan areas involves complex processes of coexistence between urban and rural dynamics, the functional redefining of central urban areas and rural areas or urban-rural surrounding transition generates land conflicts. In this paper the context of Mexico City megalopolis and its expansion process, will be discussed in the new specialization of the central city to tertiary services and increasing the value of land, it has resulted in the expulsion of the industry and social housing to the increasingly distant urban periphery. The urban development by strength of small towns that surround Mexico City, has generated various social conflicts that claim the right to a healthy environment and territory. The aim of the paper is to

analyze the process of urban expansion of the megalopolis of Mexico City to the region of Mezquital Valley, with main emphasis on urban and industrial growth and the emergence of social conflicts in response to these territory changes. The research method is the quantification of urban growth detected by statistical data and monitoring social conflicts related to urban expansion in Mezquital Valley. By the work has been revised three emblematic and recent cases of this social movements: the *Ciudades del Bicentenario* project, movements against cements industries and the MSW management project *SIGIR: Valle de México*. The main conclusions were that urban expansion has generated social and environmental impacts, for populations that are exempt from the benefits of central urban areas. These new peripheries require a comprehensive urban planning, which are considered social needs and environmental rationality. Otherwise they become bonded areas that grow in marginal conditions and are affected by the progress that generate them benefits away from them generates new problems.

Conformation of Mexico City megalopolis

The concept of megalopolis was introduced in 1961 by J. Gottman, to describe a region in exercising their area of influence on diverse metropolis, and other medium cities, that depend of the great urban areas. The characteristics proposed by Gottman of a megalopolis area: the growth of cities, the division of labor within a civilized society, the development of world resources. The author comment that the megalopolis is a particular new type of region, but is the result of age-old processes, that had conform this complex urban areas. They contain several metropolitan areas and acquire an own personality (Gottman, 1961: 4).

Another definition of megalopolis is offered by Lang & Dhavale, which considered the existence of trans-metropolitan clusters, in which a special connectivity is observed. Based on the concepts of *space places* for physical distribution of built environment. And the *space of flows*, or sets of connection that links places via transportation systems and business networks. A way to test realizer geographical complete is by considering places and flows in space (2005: 4-5). In their work they presented the megalopolis as a unit of analysis necessary in the present, which is determined by the global economy, based on the elements of place and flows to determine its location and boundaries.

The authors defined megalopolitan areas as: areas that combines at less two, but may include dozens of existing metropolitan areas; Totals more than 10,000,000 projected residents by 2040; Derives from contiguous metropolitan and micropolitan areas; Constitutes an organic cultural region whit a distinct history and identity; Occupies a roughly similar physical environment; Links large centers through major transportation infrastructure; Forms a functional urban network via goods and service flows; And, creates a usable geography that is suitable for large-scale regional planning (Lang & Dhavale, 2005: 5-6).

Given the above characterization we found that Mexico City and the eight surrounding metropolitan areas, can be classified as a megalopolis, since they meet the characteristics of delimitation proposed by the authors. Mexico City has presented an increasing expansion throughout the twentieth century, due to being the most important urban area of the country.

Conformation as metropolis expanded at first a regional crown formed by the municipalities of eastern and northern Mexico State. But its expansion and regional influence has led to the creation of a megalopolitan area consisting of the metropolitan areas of Cuernavaca, Cuautla, Puebla-Tlaxcala, Tlaxcala-Apizaco, Tianguistenco, Toluca, Tula, Pachuca, all present adjacent municipalities to the metropolitan area of Mexico Valley.

Table 1. Metropolitan areas that conform the Mexico City megalopolis

	Metropolitan Area	Population 1990	Population 2000	Population 2010	Municipalities 2015	Urban average density (hab/ha)	Land area (km ²)
1	Cuernavaca	587 495	798 782	924 964	8	70.7	1 189.9
2	Cuautla	279 697	372 256	434 147	6	51.1	979.6
3	Puebla-Tlaxcala	1 776 884	2 269 995	2 728 790	39	76.6	2 392.4
4	Tlaxcala-Apizaco	303 779	408 401	499 567	19	34.7	708.1
5	Tianguistenco	92 830	127 413	157 944	6	56.4	303.4
6	Toluca	1 110 492	1 540 452	1 936 126	15	64.8	2 203.2
7	Tula	140 438	169 901	205 812	5	30.1	591.4
8	Pachuca	276 512	375 022	512 196	7	76.3	1 196.5
9	Mexico Valley	15 563 795	18 396 677	20 116 842	76	160.1	7 866.1
	Total	19 544 427	23 660 117	26 591 424	181		16 240.7

Source: Self elaboration whit data of CONAPO, et. al. 2012.

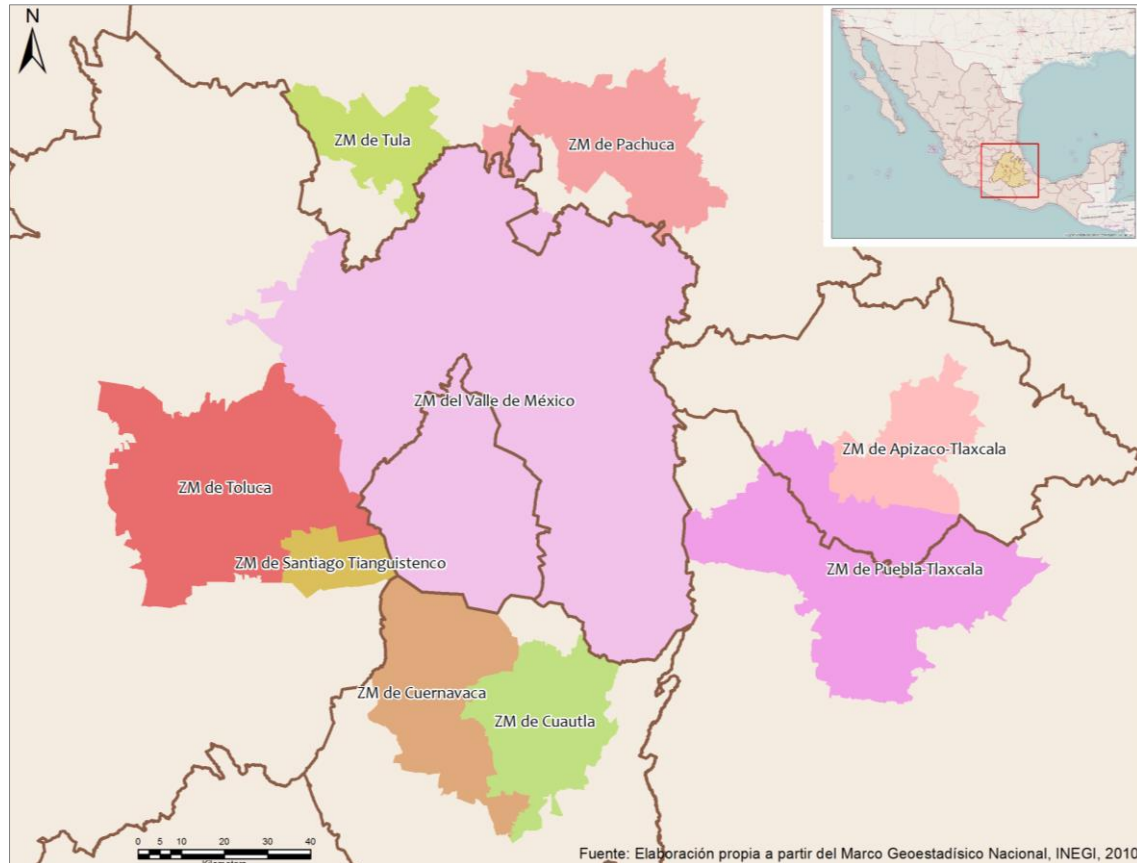
The megalopolis has a population of over 26.5 million habitants, by 2010, in addition to a complex communications network. The municipalities that compose it keep different characteristics in terms of economic activities that they develop and the population density. In the regions urban and rural areas are confronted, while Mexico City is demanding more space for urban development. By the eighties began a process of de-industrialization of Mexico City, due to the vocation towards tertiary activities. As a result the surrounding areas received the industry that the capital city expelled.

As Escamilla & Santos pointed: the expulsion of industry activities out of Mexico City as generated "a transformation of peripheral agricultural areas use discontinuous patterns of urban-rural land; circulation intensifies goods, people and capital by technological advances in transportation and communications; trendsetting manufacturing location to the periphery... where the concentration of productive activities and urban population concentrated in some cities, later redeployed in intermediate cities, process called *concentrated deconcentration*". (Escamilla & Santos, 2012, pp. 7) This concentration, involves the surroundings metropolitan areas and another intermediate cities, which has been receiving productive activities and population, making grow the area or influence of the capital.

The principals areas to receive industrial facilities was corridor Toluca-Lerma, Puebla and Mezquital Valley, in this last one, it has concentrated high pollution industry. In addition to this the site has been the natural destination for the urban sprawl of Mexico Valley metropolitan area. In this process several social conflicts have taken place, as a result of the constant

tensions that arise between the habitants of this area and the new urban configurations that take place on its territory.

Figure 1 Map of Mexico City megalopolis



Source: Self Elaboration whit data of Marco Geoestadístico Nacional (INEGI, 2010)

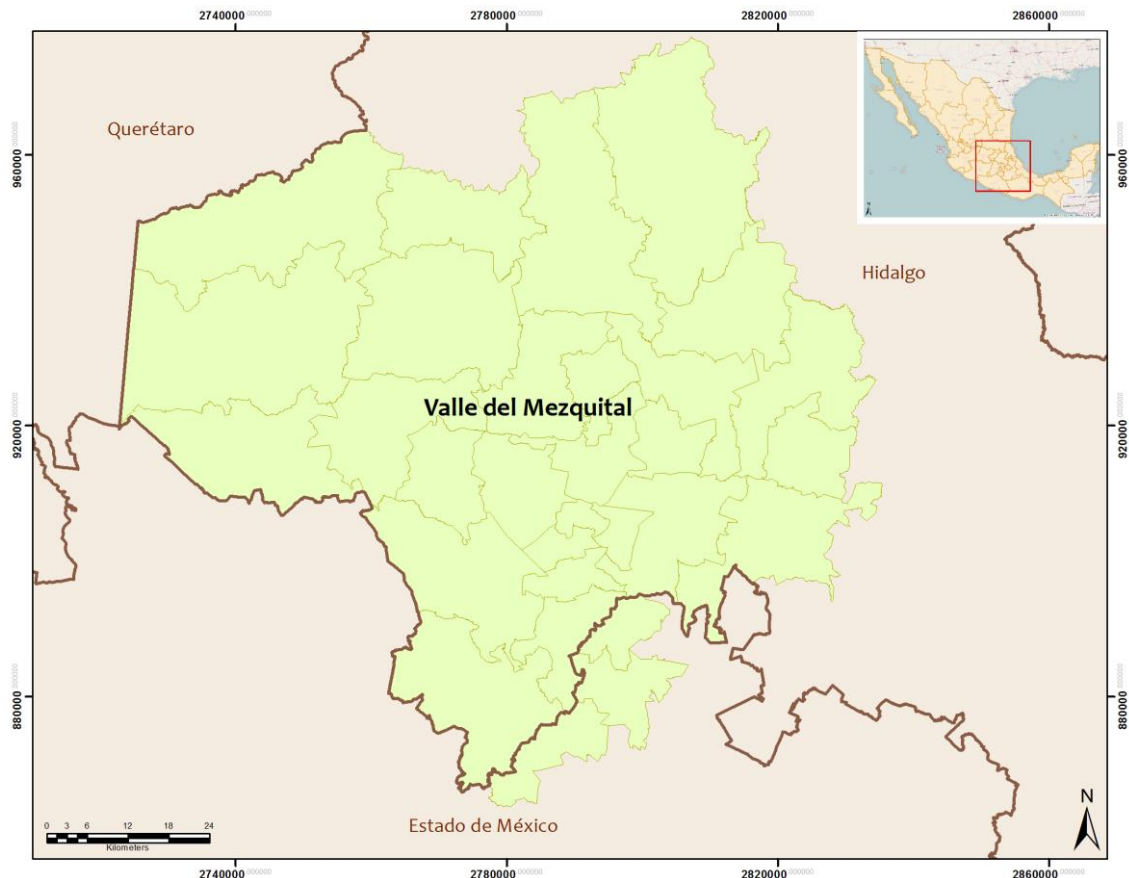
Urban and Industrial development of Mezquital Valley as an impact area of Mexico City's megalopolis sprawl

Mezquital Valley, also called Tula-Tepeji industrial corridor, is a micro region catalogued as that, for its cultural, physical and functional characteristics. Is located 60 kilometers far to Mexico City. Its extension includes 27 municipalities of Hidalgo State and 3 of Mexico State (see Map 2), whit a population of 1,050,810 habitants. From 1990 to 2010, its population increase was 147%, highlighting the municipality of Huehuetoca a 392% increase in population in the period. Other municipalities that stand out in terms of population growth are Tula, Tepeji, Ixmiquilpan and Actopan. Similarly it is in those municipalities where it has the largest concentration of industries and jobs of the micro region.

Unlike the constant in the rest of the megalopolitan area on Mezquital Valley, productive activities dominated industry, taking 36% of the population employed, predominantly on commerce and services. While the population employed in commercial sector is 33% and 30% service sector. In the period 1989-2009, the number of workplaces totals increase 385%, while

the number of employees increased by 342%, the above speaks of an accelerated economic and employment development. These workplaces increased 225% in the industrial sector. While an increase in commerce was 430% and services 565%. Resulting in an increase of 36,869 employees in the three sectors 1989 in 126,030 employees for 2009.

Figure 2 Map of location of Mezquital Valley



Source: Self Elaboration whit data of Marco Geoestadístico Nacional (Inegi, 2010)

However wages in the three sectors have increased very little, considering inflation and the purchasing power of the population by 2010, and comparing wages between 1989 and 2009 in the industrial sector increased remuneration for employees was only 9.66%. For the commercial sector the increase was 27.5% and for service sector the increase was 20.9% in twenty years. As we can observe the micro region has experienced major changes in the period of study, from the transformation towards industrial activities, to the increment of the population, generated by the location of social housing in the area. Analyze social movements come from the conflict of interest inherent in the confrontation of urban development and rural. Below we review three of these conflicts that have taken place in recent years in the area of study.

Social conflict as response of urban sprawl

In the last twenty years the Mezquital Valley, has become a peripheral housing area of Mexico City. Its proximity allows transfers are made on a daily basis allowing access to low-cost housing a large number of working people who could not afford the high rents in Mexico City. Similarly, the industrial growth of the area population generates attraction, by manufacturing employment.

However, although the conditions may seem favorable for the area, the affectations that region of Mezquital Valley suffers from the growing urban sprawl brought about the influence of the megalopolis are innumerable. In the last ten years, there have been social movements of resistance in opposition to urban development megaprojects that affect human and environmental health, and impact the territory. In Mezquital Valley there are numerous industrial parks, an oil refinery, a thermoelectric plant, seven cement plants and is also an agricultural production area that for decades has used the sewage from Mexico City to irrigate their crops.

These conditions have led to a concentration of pollutants in the area, which was considered the most polluted region in the world by UNESCO in 2005. "The seriousness of the matter can not be quantified only in its environmental dimensions, but now in human... the pollution of this region is present in soil, water and air, causing diseases such as cancer, the first recorder case of anencephaly, and communes respiratory and skin diseases" (Proceso, 2005, pp.1). Environmental issues in the area have affected human health, industrial activities and housing in outlying areas that demand public services, these developments have created social tensions on various issues affecting communities.

Social Movements as effects of urban sprawl: Ciudades del Bicentenario

The problem of population growth concentrated in Mexico City megalopolis, is a challenge for the governments involved in this territory. Mexico City undergoes a process of gentrification led to rising urban land, which has forced the expulsion of low-income population into even more remote peripheries. Initially (1980s) the urbanization expanded on neighbor municipalities in the State of Mexico, monopolizing of poor housing towns like Nezahualcoyotl, Ecatepec and Valle de Chalco. The subsequent expansion in the early twenty-first century, is given to municipalities of Hidalgo, affecting Pachuca metropolitan area and to Mexico State, particularly in Toluca metropolitan area. Currently the Federal and Mexico State governments have developed a social housing program called *Ciudades del Bicentenario*.

The former aims to create: "population centers selected for their location, their ability to receive significant population increases, to be able to accommodate infrastructure and strategic facilities and being in position to have any means of sufficient communication network to allow regional and national articulation. The purpose is to concentrate infrastructure and equipment in strategic population centers for land use planning... This must be model cities, self-sufficient, properly planned and highly competitive" (GEM, 2007, pp. 3). The *Ciudades del Bicentenario* are projected to accommodate 2,125,000 habitants and 492,000 social housing by 2020, the development of six of these urban centers is projected in Mexico State (in the municipalities of

Almoya de Juarez, Atlacomulco, Jilotepec, Huehuetoca, Zumpango and Tecamac) (GEM, 2007, pp. 10-15). All of them located in rural areas, being subject of rapid urban development. In this section we will refer to the one located in Huehuetoca, belonging to the region of the Mezquital Valley and which has led to a social resistance against the project.

The *Ciudad del Bicentenario* located in Huehuetoca plans to built 104,100 houses, for 447,700 inhabitants, and the installation of industries in 822 hectares, which will generate about 61,600 jobs (GEM, 2007, pp. 13). Yet eight years into the project are multiple critics towards it, since the integral development has been limited to the residential building, without a strategic planning services and efficient mobility to workplaces, and have not captured the alleged industries for job creation. The municipality has not received a significant increase budget to attend basic services (water, sewer, electricity, garbage collection, security, etc.): “They present in water shortages terminus generals, deterioration of structures and some equipment, and mobility problems. Thousands of homes are uninhabited and/or abandoned” (Alcántara, 2013, pp. 1).

Opposition to the project by groups organized in Huehuetoca and neighboring municipalities, comes from the detection of flaws in the plan, such as those mentioned above. It is reported that the development has concentrated a large number of new homes in the area, which are in competition for basic services that the municipality must provide, but do not have the economic or operative capacity for its endowment. Also the emergence of different social pathologies such vandalism, theft and robbery and social rupture: Usually it is low-income families, where adults require travel long distances daily to workplaces, leaving children and adolescents alone most of the time, so that about broken families. The location of these large housing developments in rural municipalities with deficient infrastructure for mobility, congested roads. For residents of these new housing complexes, daily transportation to workplaces, represent a major economic and time investment, which becomes the deterioration of their quality of life.

So far, the development of *Ciudades del Bicentenario*, has only meant the rise of real state markets near the project (Espinosa-Castillo, 2014, pp.9), for the benefit of private companies. Communities in opposition denounce the dispossession suffered from their lands and natural resources: “The implementation of this strategy has generated diverse populations within the state territory, have been deprived of the use and enjoyment of the various natural assets that have protected and conserver ancestrally, because the purpose of government of Mexico State is to take these goods to consolidate catastrophic urban and industrials mega-developments named *Ciudades del Bicentenario*, hidden under a discourse of modernization, economic development and competitiveness” (CDHZL, 2015, pp. 7).

Once started the projects, the state government has not followed up on their development, so this type of housing is not sustainable, as was the claim. The result is the appropriation of agricultural soils in the generation of homes that do not contribute to personal development of its habitants and generate conflicts whit first residents, who see their territory transformed into rapid urbanization without direct benefits for communities and for new residents who don't have the basics services that need.

Social movements against cement plants

Mezquital Valley has large areas of limestone and other quarries, it is why mining for extracting various rocks has been a traditional economic activity. The first cement plant in this area, settled in the early twentieth century in Atotonilco, then followed installing cement plants in Mezquital Valley. Currently exist three in the municipality of Atotonilco, one in Apaxco, one in Huichapan, one in Tula and another in Santiago de Anaya. Their environmental impacts are felt in different processes, as it is a opencast mining activity, the extractive process generates dust that promote airway diseases and deposited in soil, vegetation, water and crops. The second part of cement productive process involves spraying the stone from the application of heat cement kilns used as fuel oil derives, like industrials and waste tires. Since 2012 the incineration of municipal solid waste (MSW) from Mexico City began, causing the impact of air pollution increases.

Conflicts against the cement industry began in 2009 in the municipalities of Atotonilco and Apaxco, as a result of poor management of industrials wastes to be incinerated on Holcim cement kilns. Community detected chemical leakage from Ecoltec (the plant of transfer industrial waste, to be incinerated in the cement plant). These leaks were seen as strong smell of chemicals in the environment and the wastewater discharge Ecoltec, towards river. The consequences were the death of cattle that drank river water, then two strong explosions inside Ecoltec plant, but the event that most alarmed the community was the death of eleven farmers who died by accidentally inhaling toxic fumes from Ecoltec downloads. These events led to the formation of a social movement whit people of both municipalities which kept Ecoltec plant, closed for two years. Currently continued the resistance against the harmful effects of four cement plants in the two communities and the waste transfer plan Ecoltec.

Another conflict arose in Huichapan in 2012, when the incineration of MSW from Mexico City began in the Cemex cement plant. The residents of the municipality perceived strong and unpleasant odors from the plant, this triggered a series of protest and actions that gradually led the government to order stop the incineration of MSW at the plant. However the cement companies located in Hidalgo (Holcim, Lafarge, Fortaleza, Cemex and Cruz Azul) work whit state government legalizer MSW incineration and overcome social resistance by legal means.

The lasts conflict came against cement plants in the community of Santiago de Anaya in 2013, as resistance to the installation of the cement plant of the Fortaleza Group. In the installation of this industrial facilities, did not have the necessary permits from state and local governments, in addition to the irregularities during construction. The neighbors have denounced what they were overrun their land for the installation of powers lines, as having suffered damaged to their homes. So far the authorities have not given a favorable response to the residents, after the damages they have suffered.

Allegations of communities to cement industries are of a various kind, ranging from the invasion of a property, environmental pollution, the effects on human health, to the loss of human lives. Lack of planning leads to the coexistence of communities whit these industries, mostly settled in the middle of urban areas. But another important discontent community factor, is the collusion between business and government to carry out productive projects, even at the expense community well-being.

Conflicts for the management MSW: SIGIR-Valle de México.

In 2014, three municipalities in Mexico State signed an agreement for the creation of a body for the management of MSW, the called Intercity System of Waste Management (SIGIR-Valle de Mexico) was agreed by the municipal presidents of Huehuetoca, Apaxco and Coyotepec. The purpose is handling 160 tons of garbage daily, which are produced by 166, 474 inhabitants of the three municipalities. The agreement establishes the creation of a public organism that charged for the disposal of each ton of garbage a price proposed by the self organism, not by the municipalities. The organism will have own juridical personality, its own assets and budget, while municipalities undertake the purchase of the land for the operation of SIGIR-Valle de Mexico, pay staff salaries and operating costs. As well pay for the ton of waste dispose by the organism (AHAC, 2014, pp. 9-10). The organism may also market the MSW and foment the marketing of products derived from waste (AHAC, 2014, pp. 21).

Upon learning of the existence of the agreement between the three municipalities concerned citizens began the opposition to it, that's the risk by means of waste incineration, a situation that has had a bad antecedent in Apaxco for the presence of Ecoltec and Holcim cements. The landfill for SIGIR-Valle de Mexico, will be located in Apaxco (Gallegos, 2015), being the only one of three municipalities that as a cement plant, the MSW allocated to the plant for incineration. The opposition also contemplated that the costs of maintaining the SIGIR-Valle de Mexico, represent an arbitrary measure of the municipalities, which are subject to the cost that a particular wants to impose, taking as an added benefit the marketing of the sale of recyclable and merchantable waste.

The organism would be available any decision on the handling of waste and generate property for marketing and disposal in cement kilns: "the goal (of SIGIR-Valle de Mexico) is realize any activity related to the service public of clean, collection, transportation, treatment and disposal of solid waste" (AHAC, 2014, pp. 8-9). In that sense run any inherent action to it as gathering, reception, transportation, storage, use, recycling, processing, marketing and disposal of MSW, special management included hazardous domestic waste. Having the faculty of hiring third parties for such activities. A group of citizens in Apaxco begun a program of zero waste, that consist in the recollection, commercialization, recycling and composting of waste. The pilot program has been successfully applied in Santa Maria barrio of Apaxco. The aim is to demonstrate to local government, can be a sustainable way to manage the MSW, obtaining a profit of the activity and avoiding the pollution of incinerated waste in cement kilns. (Carrasco & Vargas, 2015, pp. 104-105)

The waste transfer centers is a initiative also applied in another states; Hidalgo is to work with these schemes for waste management, "In march 2016, the Environment Secretary announced the creation of two waste transfer centers that will be located in Huichapan and Mineral del Monte. The first will receives waste from six municipalities, while the second will provide services to eight. The claim is that these transfer center modernize the treatment of waste, turning it into electricity, by thermic treatments" (Jimenez, 2016, pp. 1). In regard is with incineration or co-processing of waste, highly pollution activities. "Besides aims the construction of such facilities in Tula, Tepeji and Ajacuba" (Jimenez, 2016, pp. 1).

This form of MSW treatment is a way to profit from waste. The initiative is driven largely by cement companies that charge to local governments by incineration. The expectation of those companies is to promote a National Waste Law, where these are considered as raw material subject to exploitation as fuel on cement kilns.

Conclusions

Population growth and attraction of Mexico City megalopolis is inevitable, since pre Columbian times this human settlement has been the main urban area of the country, represents an economic and cultural dynamism. Its influence is undisputed on a national and international level, becoming one of the largest and most important cities in the world and a point of financial influence in Latin America. Its economic, political and social development has been so rapid urban sprawl, which brings environmental and social problems, which become territorial conflicts.

The lack of interest in a rational and responsible territorial planning towards the environment and communities causes conflict and confrontation. In words of the affected communities: "From our experience, we observe the existence of a constant dispute, mainly between indigenous communities and government authorities, for control of common goods, among which water and earth" (CDHZZ, 2015, pp. 6). Conflicts in the study area continue to rise, it is therefore necessary that the authorities seek ways of development that take into account the needs and welfare of its inhabitants.

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Appendix

Table 2. Municipalities that conform Mezquital Valley Region

	State	Name	Population 1990	Population 2010
1	Hidalgo	Actopan	40 613	54 299
2	Hidalgo	Ajacuba	12 704	17 055

3	Hidalgo	Alfayucan	16 830	18 879
4	Hidalgo	El Arenal	12 650	17 374
5	Hidalgo	Atitalaquia	17 626	26 904
6	Hidalgo	Atotonilco	19 327	31 078
7	Hidalgo	Cardonal	17 731	18 427
8	Hidalgo	Chapatongo	11 108	12 271
9	Hidalgo	Chilcuautila	13 697	17 436
10	Hidalgo	Francisco I. Madero	25 554	33 901
11	Hidalgo	Huichapan	33 479	44 253
12	Hidalgo	Ixmiquilpan	65 934	86 363
13	Hidalgo	Mixquihuala de Juarez	31 137	42 834
14	Hidalgo	Nopala de Villagran	13 456	15 666
15	Hidalgo	Progreso de Obregon	17 156	22 217
16	Hidalgo	San Agustin Tlaxiaca	19 941	32 057
17	Hidalgo	San Salvador	25 674	32 773
18	Hidalgo	Santiago de Anaya	12 457	16 014
19	Hidalgo	Tasquillo	15 090	16 865
20	Hidalgo	Tecozautla	27 224	35 067
21	Hidalgo	Tepeji del Rio de Ocampo	51 199	80 612
22	Hidalgo	Tepetitlan	7 430	9 940
23	Hidalgo	Tetepango	6 871	11 112
24	Hidalgo	Tezontepec de Aldama	31 651	48 025
25	Hidalgo	Tlahuelilpan	11 508	17 153
26	Hidalgo	Taxcoapan	18 264	26 758
27	Hidalgo	Tula de Allende	73 713	103 919
28	Mexico	Apaxco	18 500	27 521
29	Mexico	Huehuetoca	25 529	100 023
30	Mexico	Tequixquiac	20 784	33 907
Total			714 837	1 050 703

Source: Self elaboration whit data of INEGI, 1990 and 2010.